查询APL431供应商

APL431

Adjustable Precision Shunt Regulator

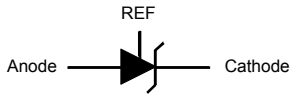
Features

- Precise Reference Voltage to 2.500V
- Guaranteed 0.5%, 1% or 2% Reference Voltage Tolerance
- Sink Current Capability, 1mA to 100mA
- Quick Turn-on
- Adjustable Output Voltage, $V_O = V_{ref}$ to 20V
- Low Operational Cathode Current, 250μA Typical
- 0.1Ω Typical Output Impedance
- SOT-23, SOT-23-5, SOT-89, SO-8, TO-92 and TO-92S Packages

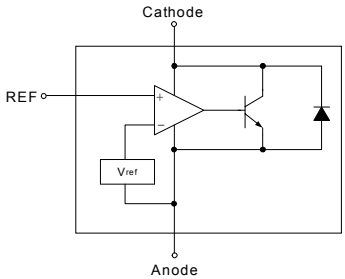
Applications

- Linear Regulators
- Adjustable Power Supply
- Switching Power Supply

Symbol

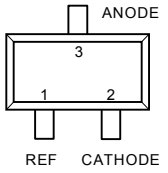


Functional Diagram

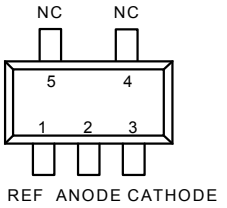


General Description

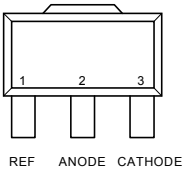
The APL431 is a 3-terminal adjustable voltage reference with specified thermal stability over applicable commercial temperature ranges. Output voltage may be set to any value between V_{ref} (2.5 V) and 20 V with two external resistors (see Figure 2). When used with an photocoupler, the APL431 is an ideal voltage reference in isolated feedback circuits for 2.5V to 12V switching-mode power supplies. This device has a typical output impedance of 0.1Ω. Active output circuitry provides a very sharp turn-on characteristic, making the APL431 excellent replacements for zener diodes in many applications, including on-board regulation and adjustable power supplies.



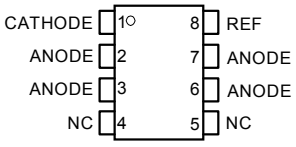
SOT-23 (Top View)



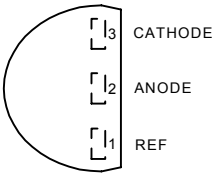
SOT-23-5 (Top View)



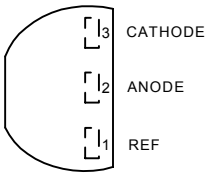
SOT-89 (Top View)



SO-8 (Top View)



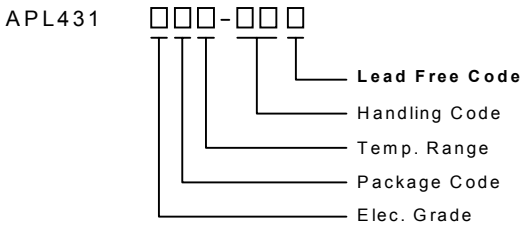
TO-92 (Top View)



TO-92S (Top View)

ANPEC reserves the right to make changes to improve reliability or manufacturability without notice, and advise customers to obtain the latest version of relevant information to verify before placing orders.

Ordering and Marking Information



Elec. Grade
A : 0.5% Reference Voltage Tolerance
B : 1% Reference Voltage Tolerance
C : 2% Reference Voltage Tolerance
Package Code
A : SOT-23 B : SOT-23-5 D : SOT-89
E : TO-92 I : TO-92S K : SO-8
Y : Chip Form
Temp. Range
C : 0 to 70 °C I : -40 to 85 °C
Handling Code
PB : Plastic Bag TB : Tape & Box
TR : Tape & Reel
Lead Free Code
L : Lead Free Device
Blank : Orginal Device

APL431 A/B : 431

APL431 E/I : APL 431 XXXXX — XXXXX - Date Code

APL431 D/K : APL431 XXXXX — XXXXX - Date Code

Absolute Maximum Ratings

Symbol	Parameter		Rating	Unit
V_{KA}	Cathode voltage		20	V
I_K	Continuous cathode current range		100	mA
I_{REF}	Reference current range		3	mA
θ_{JA}	Thermal Resistance from Junction to Ambient in Free Air			°C/W
		SOT-23	416	
		SOT-23-5	357	
		SOT-89	250	
		TO-92	250	
		SO-8	210	
T_A	Ambient temperature range	APL431XXC	0 to 70	°C
		APL431XXI	-40 to 85	
T_j	Junction temperature range	APL431XXC	0 to 150	°C
		APL431XXI	-40 to 150	
T_{STG}	Storage Temperature Range		-65 to 150	°C
T_{SOL}	Lead temperature range, T_s (Soldering, 10sec)			
		Original Device	260	°C
		Lead Free Device	300	

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Electrical Characteristics (Cont.) T_A= 25°C (unless otherwise noted)

Symbol	Parameter	Test Conditions		APL431 Min.	APL431 Typ.	APL431 Max.	Unit
V_{REF}	Reference voltage	$V_{KA}=V_{REF}$, I_K=10mA*1	APL431A	2.487	2.500	2.513	V
			APL431B	2.475	2.500	2.525	
			APL431C	2.450	2.500	2.550	
ΔV_{REF} / T	Reference voltage drift over temp. range	$V_{KA}=V_{REF}$,I_K=10mA T_A =0 to 70°C*1 T_A =-40 to 85°C*1				20 30	mV
ΔV_{REF} / ΔV_{KA}	Voltage ratio (open loop gain)	I_K=10mA, $V_{KA}=V_{REF}$ to 10V*2			-1.5	-3	mV/V
		I_K=10mA, $V_{KA}=V_{REF}$ to 20V*2			-1.2	-2.5	
I_{REF}	Reference current	I_K=10mA, R_1=10kΩ, R_2=open*2			1.0	3	µA
ΔI_{REF}/T	Reference current drift	I_K=10mA, R_1=10kΩ, R_2=open, T_A= -40 to 85°C*2			0.3	1	µA
$I_{K(min)}$	Min. cathode current	$V_{KA}=V_{REF}$ *1			0.25	0.5	mA
$I_{K(off)}$	Off-state cathode current	V_{KA}= 20V, V_{REF}= 0V*3			0.1	1	µA
$\|Z_{KA}\|$	Dynamic impedance	$V_{KA}=V_{REF}$ I_K=1mA to 100mA, f ≤1kHz*1			0.1	0.4	Ω
I_K	Cathode current	$V_{KA}=V_{REF}$+ 50mV*2				100	mA

Notes : *1 : use Figure 1
*2 : use Figure 2
*3 : use Figure 3

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Test figures

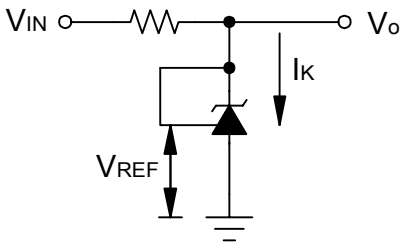


Figure 1. Test Circuit for $V_{KA}=V_{REF}$, $V_O=V_{KA}=V_{REF}$

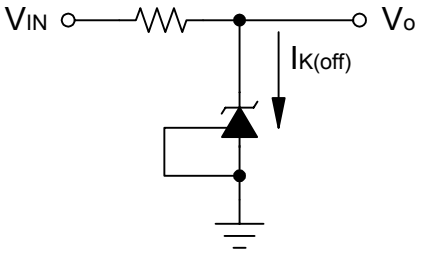


Figure 3. Test Circuit for $I_{K(off)}$

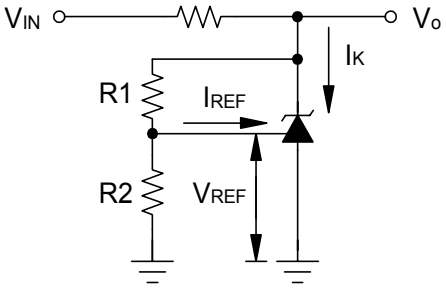
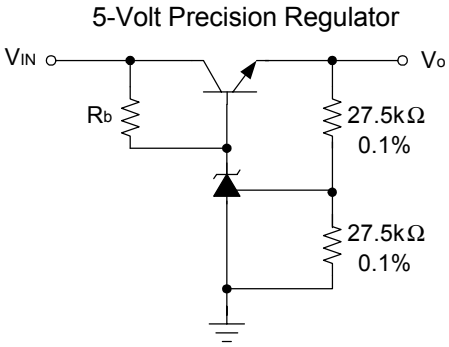


Figure 2. Test Circuit for $V_{KA}>V_{REF}$,
$V_O= V_{KA}= V_{REF}\times (1+R_1/R_2) + I_{REF}\times R_1$

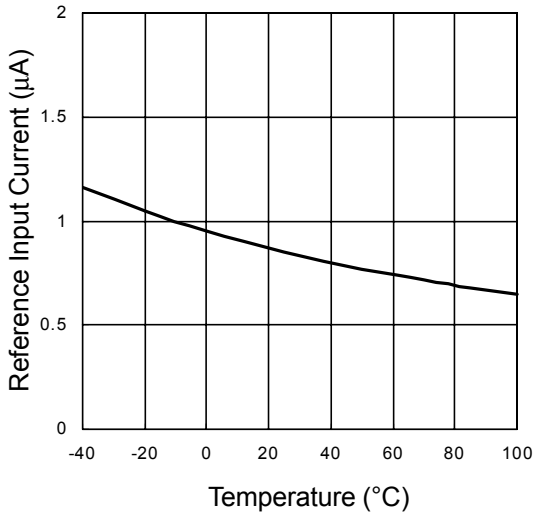
Application schematic



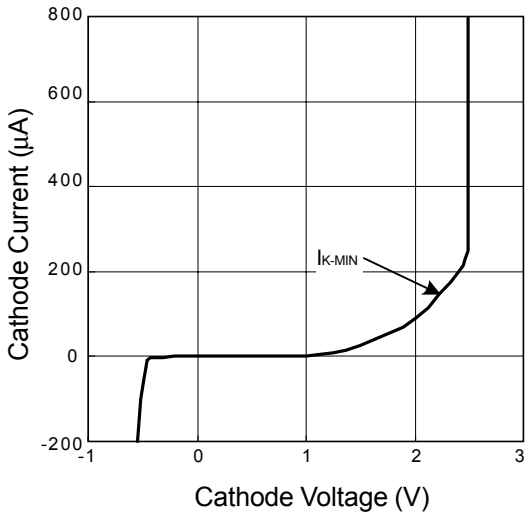
* R_b should provide cathode current large than 1mA to maintain APL431 work properly.

Typical Characteristics

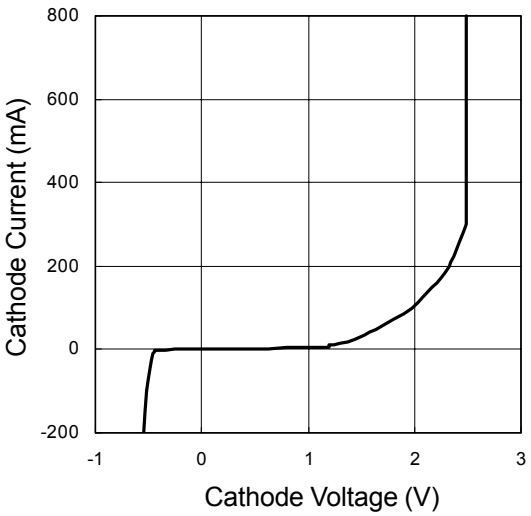
Reference Input Current vs. Temperature



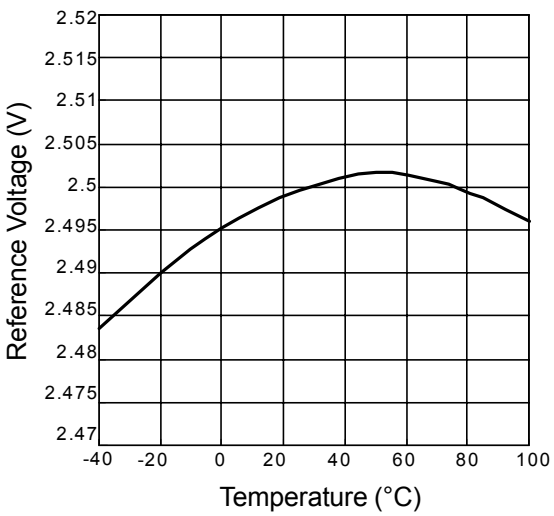
Cathode Current vs. Cathode Voltage



Cathode Current vs. Cathode Voltage



Reference Voltage vs. Temperature



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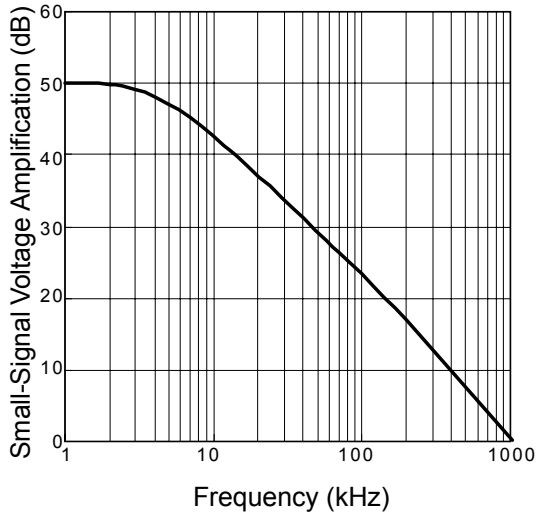
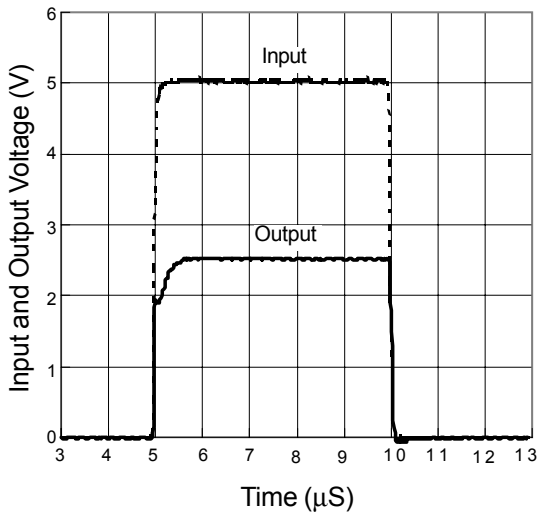
Typical Characteristics (Cont.)

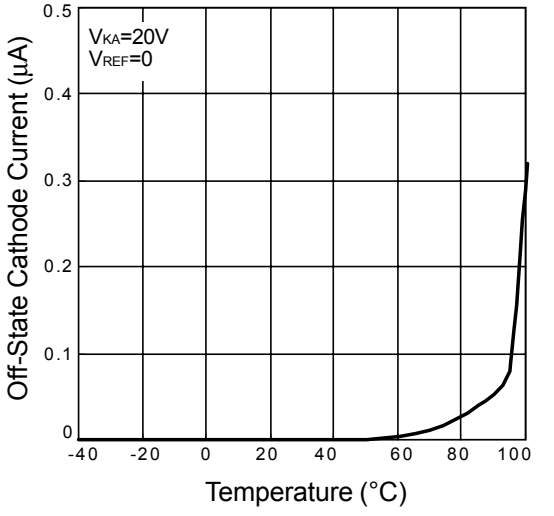
Small-Signal Voltage Amplification vs. Frequency



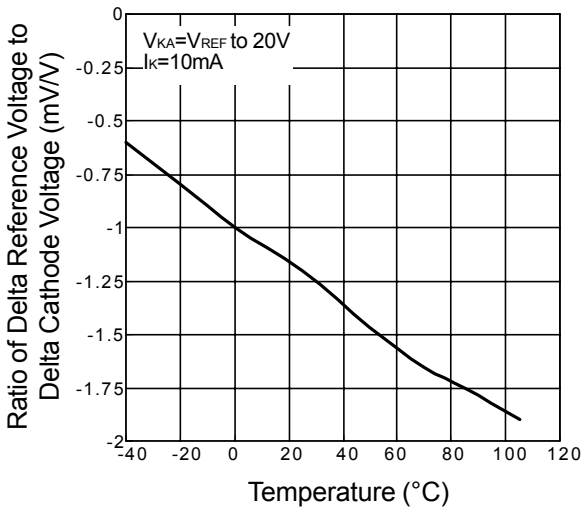
Pulse Response



Off-State Cathode Current vs. Temperature



Ratio of Delta Reference Voltage to Delta Cathode Voltage vs. Tmperature



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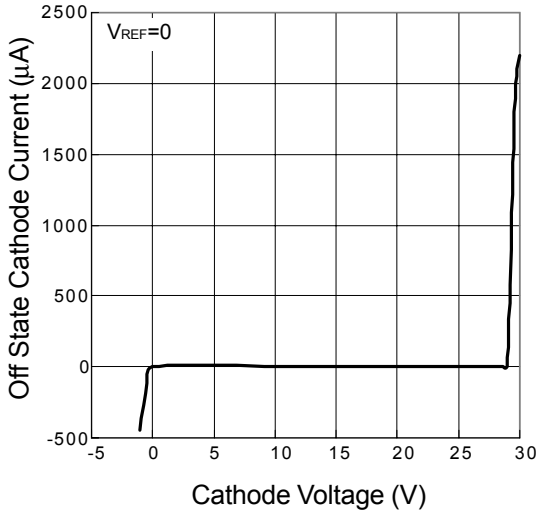
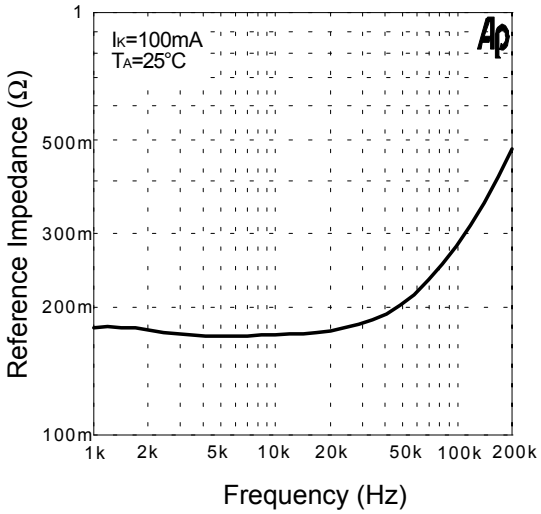
Typical Characteristics (Cont.)

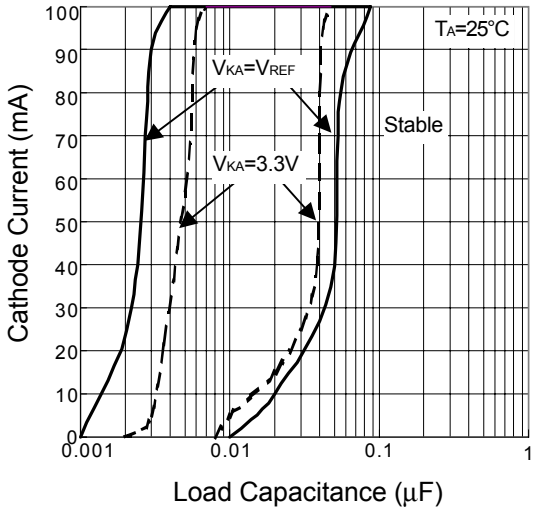
Off State Cathode Current vs. Cathode Voltage



Reference Impedance vs. Frequency

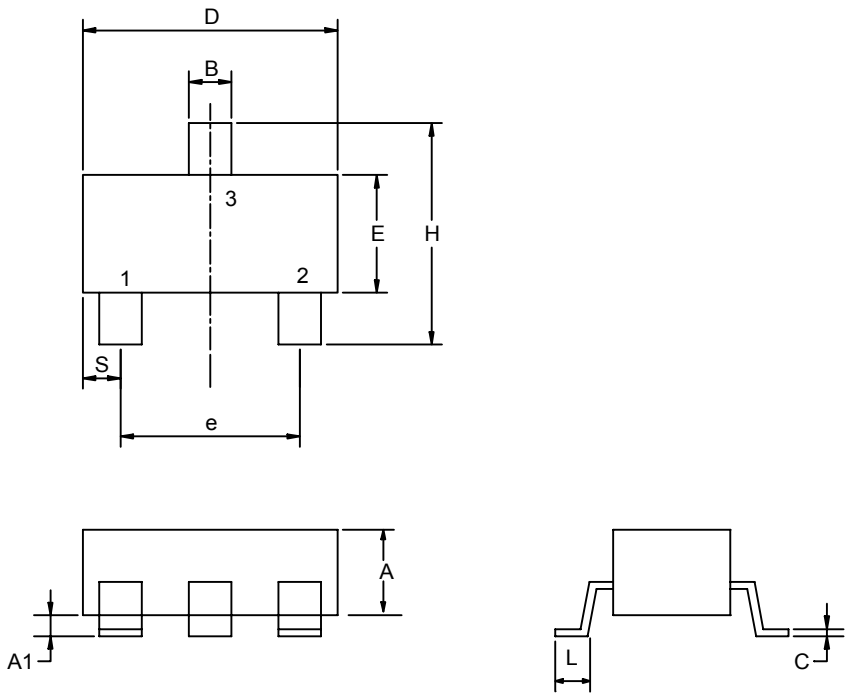


Stability Boundary Conditions



Packaging Information

SOT-23



Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.00	1.30	0.039	0.051
A1	0.00	0.10	0.000	0.004
B	0.35	0.51	0.014	0.020
C	0.10	0.25	0.004	0.010
D	2.70	3.10	0.106	0.122
E	1.40	1.80	0.055	0.071
e	1.90 BSC		0.075 BSC	
H	2.40	3.00	0.094	0.118
L	0.37		0.0015	

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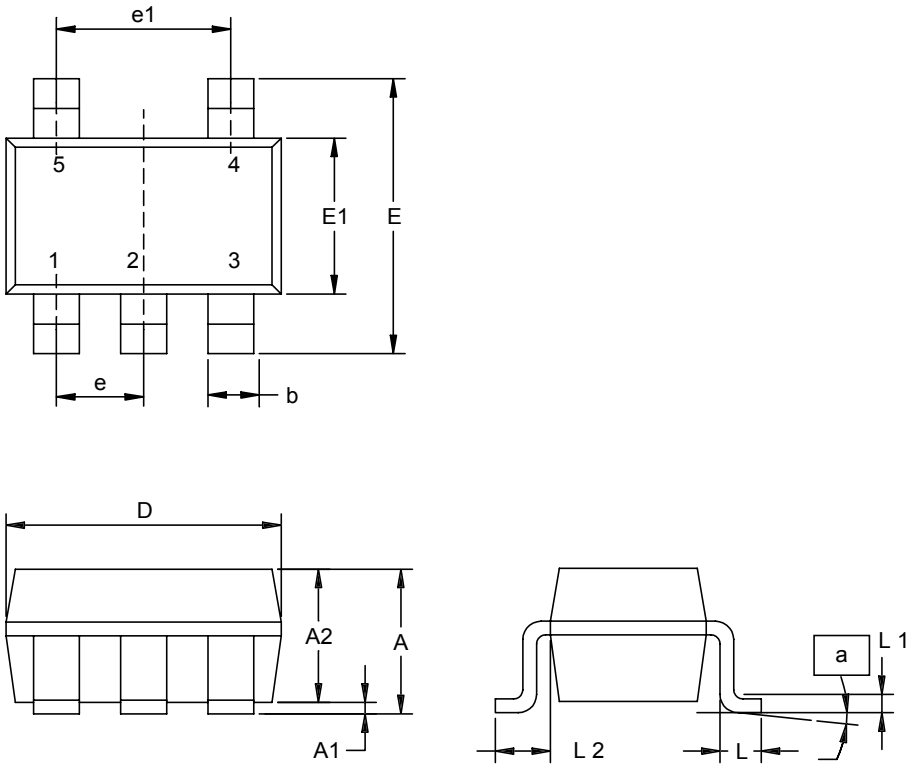
Packaging Information

SOT-23-5



Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	0.95	1.45	0.037	0.057
A1	0.05	0.15	0.002	0.006
A2	0.90	1.30	0.035	0.051
D	2.8	3.00	0.110	0.118
E	2.6	3.00	0.102	0.118
E1	1.5	1.70	0.059	0.067
L	0.35	0.55	0.014	0.022
L1	0.20 BSC		0.008 BSC	
L2	0.5	0.7	0.020	0.028
N	5		5	
α	0°	10°	0°	10°

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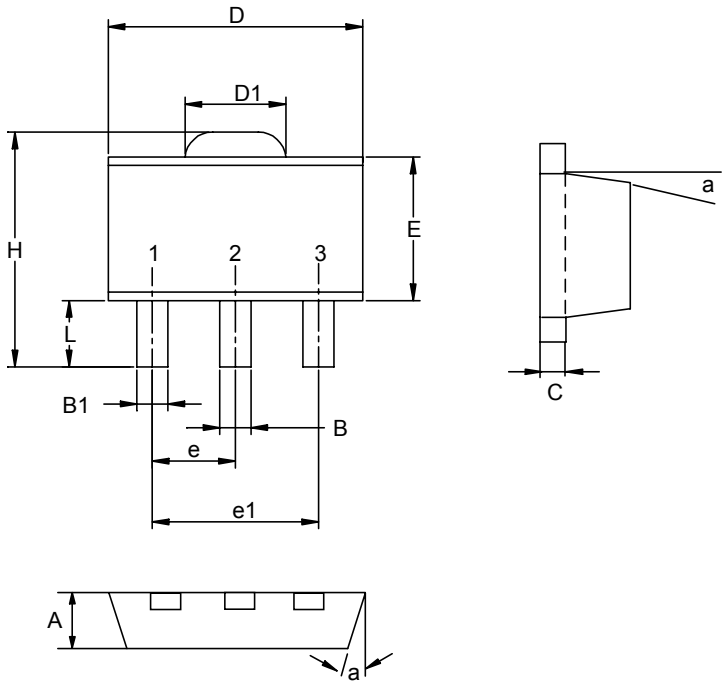
Packaging Information

SOT-89



Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.40	1.60	0.055	0.063
B	0.40	0.56	0.016	0.022
B1	0.35	0.48	0.014	0.019
C	0.35	0.44	0.014	0.017
D	4.40	4.60	0.173	0.181
D1	1.35	1.83	0.053	0.072
e	1.50 BSC		0.059 BSC	
e1	3.00 BSC		0.118 BSC	
E	2.29	2.60	0.090	0.102
H	3.75	4.25	0.148	0.167
L	0.80	1.20	0.031	0.047
α		10°		10°

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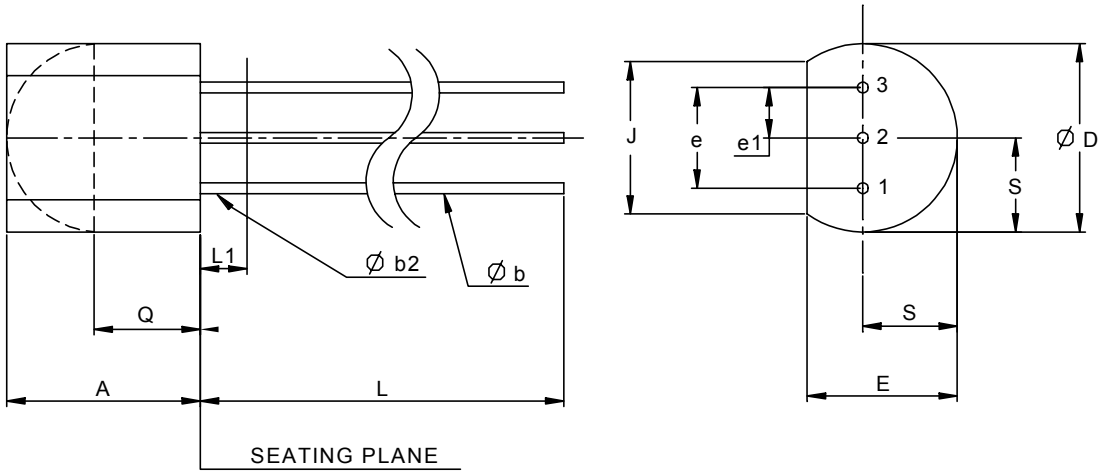
Packaging Information

TO-92



Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.318	5.334	0.170	0.210
ϕ b	0.406	0.559	0.016	0.022
ϕ b2	0.406	0.559	0.016	0.022
ϕ D	4.445	5.207	0.175	0.205
E	3.175	4.191	0.125	0.165
e	2.413	2.667	0.095	0.105
e1	1.143	1.397	0.045	0.055
J	3.429		0.135	
L	12.70		0.500	
L1		1.27		0.050
Q	2.921		0.115	
S	2.032	2.667	0.080	0.105

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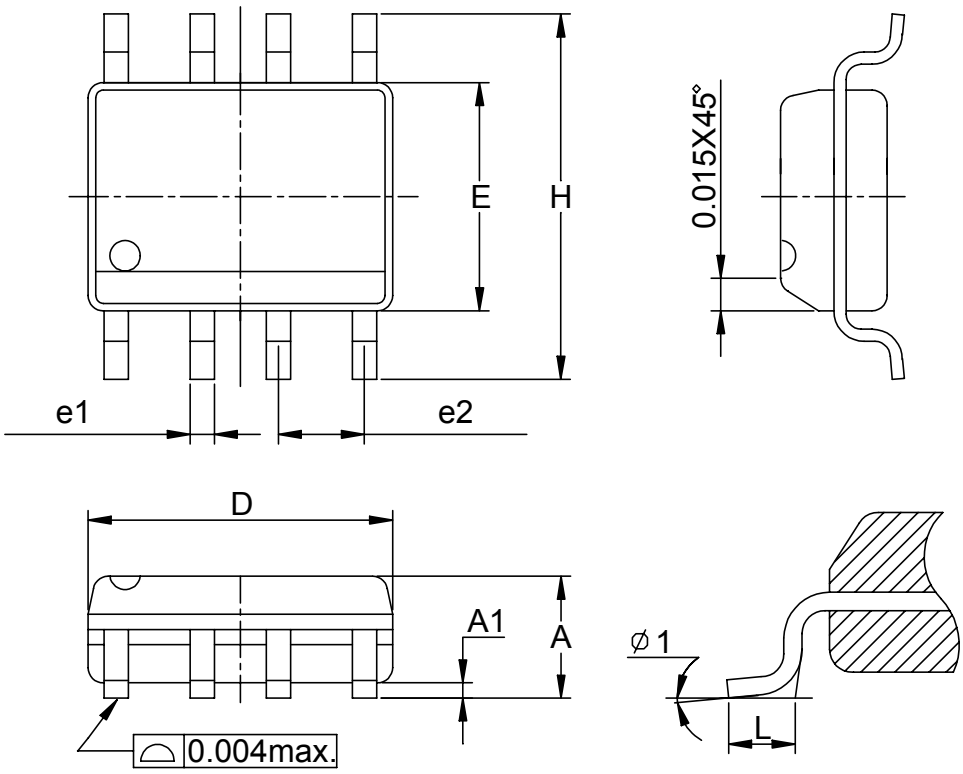
Packaging Information

SO-8



Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
D	4.80	5.00	0.189	0.197
E	3.80	4.00	0.150	0.157
H	5.80	6.20	0.228	0.244
L	0.40	1.27	0.016	0.050
e1	0.33	0.51	0.013	0.020
e2	1.27BSC		0.50BSC	
ϕ 1	8°		8°	

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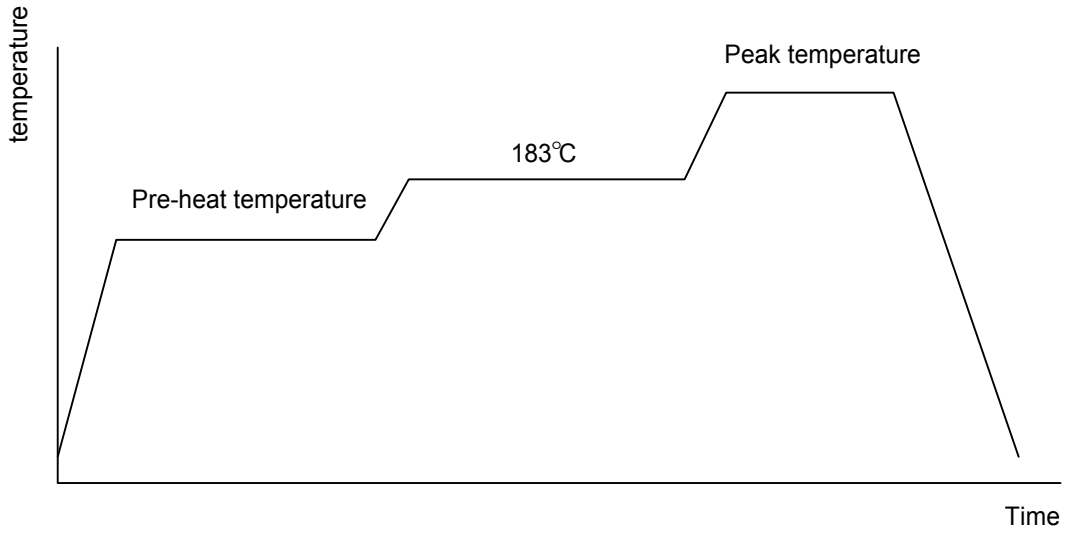
Physical Specifications

Terminal Material	Solder-Plated Copper (Solder Material : 90/10 or 63/37 SnPb)
Lead Solderability	Meets EIA Specification RSI86-91, ANSI/J-STD-002 Category 3.

Reflow Condition (IR/Convection or VPR Reflow)

Reference JEDEC Standard J-STD-020A APRIL 1999



Classification Reflow Profiles

	Convection or IR/ Convection	VPR
Average ramp-up rate(183°C to Peak)	3°C/second max.	10 °C /second max.
Preheat temperature 125 ± 25°C)	120 seconds max	
Temperature maintained above 183°C	60 – 150 seconds	
Time within 5°C of actual peak temperature	10 –20 seconds	60 seconds
Peak temperature range	220 +5/-0°C or 235 +5/-0°C	215-219°C or 235 +5/-0°C
Ramp-down rate	6 °C /second max.	10 °C /second max.
Time 25°C to peak temperature	6 minutes max.	

Package Reflow Conditions

pkg. thickness ≥ 2.5mm and all bgas	pkg. thickness < 2.5mm and pkg. volume ≥ 350 mm³	pkg. thickness < 2.5mm and pkg. volume < 350mm³
Convection 220 +5/-0 °C		Convection 235 +5/-0 °C
VPR 215-219 °C		VPR 235 +5/-0 °C
IR/Convection 220 +5/-0 °C		IR/Convection 235 +5/-0 °C

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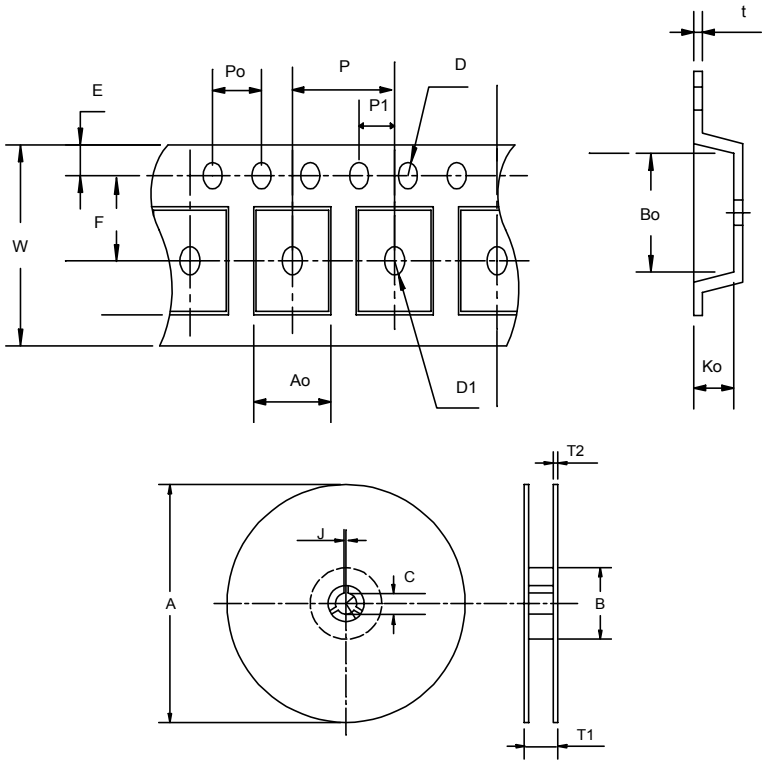
Reliability test program

Test item	Method	Description
SOLDERABILITY	MIL-STD-883D-2003	245°C , 5 SEC
HOLT	MIL-STD-883D-1005.7	1000 Hrs Bias @ 125 °C
PCT	JESD-22-B, A102	168 Hrs, 100 % RH , 121°C
TST	MIL-STD-883D-1011.9	-65°C ~ 150°C, 200 Cycles
ESD	MIL-STD-883D-3015.7	VHBM > 2KV, VMM > 200V
Latch-Up	JESD 78	10ms , I_{tr} > 100mA

Carrier Tape & Reel Dimensions



Application	A	B	C	J	T1	T2	W	P	E
SOP- 8	330 ± 1	62 +1.5	12.75+ 0.15	2 ± 0.5	12.4 ± 0.2	2 ± 0.2	12± 0. 3	8± 0.1	1.75±0.1
	F	D	D1	Po	P1	Ao	Bo	Ko	t
	5.5± 1	1.55 +0.1	1.55+ 0.25	4.0 ± 0.1	2.0 ± 0.1	6.4 ± 0.1	5.2± 0. 1	2.1± 0.1	0.3±0.013
Application	A	B	C	J	T1	T2	W	P	E
SOT-23	178±1	60 ± 1.0	12.0	2.5 ± 0.15	9.0 ± 0.5	1.4	8.0+ 0.3 - 0.3	4.0	1.75
	F	D	D1	Po	P1	Ao	Bo	Ko	t
	3.5 ± 0.05	1.5 +0.1	φ 0.1MIN	4.0	2.0 ± 0.05	3.1	3.0	1.3	0.2±0.03

(mm)

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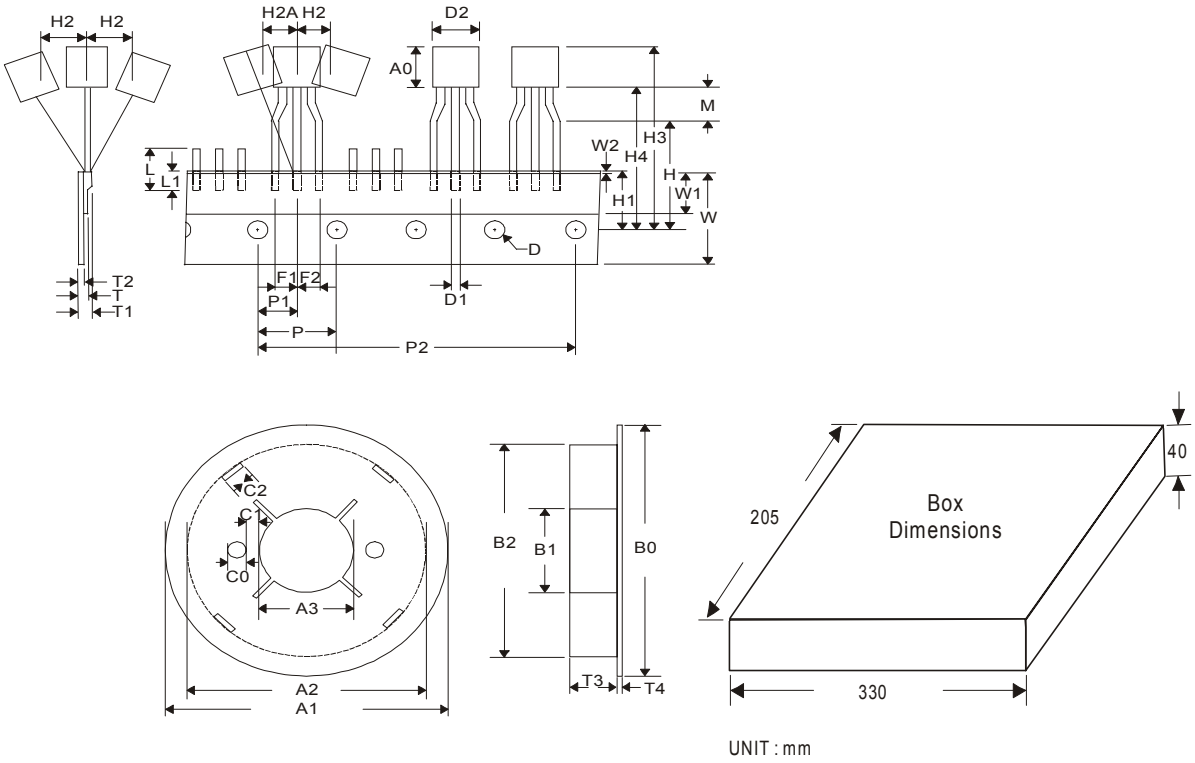
Application	A	B	C	J	T1	T2	W	P	E
SOT-23-5	178 ±1	72 ± 1.0	13.0 + 0.2	2.5 ± 0.15	8.4 ± 2	1.5 ± 0.3	8.0 ± 0.3	4 ± 0.1	1.75± 0.1
	F	D	D1	Po	P1	Ao	Bo	Ko	t
	3.5 ± 0.05	1.5± 0.1	1.5± 0.1	4.0 ± 0.1	2.0 ± 0.1	3.15 ± 0.1	3.2± 0.1	1.4± 0.1	0.2±0.033
Application	A	B	C	J	T1	T2	W	P	E
SOT-89	178 ±1	70 ± 2	13.5 ± 0.15	3 ± 0.15	14 ± 2	1.3 ± 0.3	12 + 0.3 12 - 0.1	8 ± 0.1	1.75± 0.1
	F	D	D1	Po	P1	Ao	Bo	Ko	t
	5.5 ± 0.05	1.5± 0.1	1.5± 0.1	4.0 ± 0.1	2.0 ± 0.1	4.8 ± 0.1	4.5± 0.1	1.80± 0.1	0.3±0.013

(mm)

Carrier Tape & Reel Dimensions



UNIT : mm

Application	A0	A1	A2	A3	B0	B1	B2	C0	C1
TO-92	3.18~12	90±1	76±1	30±1	90±1	31±1	76±1	5.8	3.8
	C2	D	D1	D2	F1=F2	F1-F2	M	H	H1
	7.8	4.0±0.2	0.36~0.53	9.0 MAX	2.5+0.2 -0.1	±0.3	2.5±0.5	16±0.5	9±0.5
	H2	H2A	H3	H4	H5=H0+M	L	L1	P	P1
	0.5 MAX	0.5 MAX	27.0 MAX	20.0 MAX	18.5±0.5	11.0 MAX	2.5 MIN	12.7±0.3	6.35±0.4
	P2	T	T1	T2	T3	T4	W	W1	W2
	50.8±0.5	0.55 MAX	1.42 MAX	0.36~0.68	15	1.7	18.0±0.2	6.0±0.2	≤1

(mm)

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Cover Tape Dimensions

Application	Carrier Width	Cover Tape Width	Devices Per Reel
SOP- 8	12	9.3	2500
SOT- 23	8	5.3	3000
SOT- 23-5	8	5.3	3000
SOT- 89	12	9.3	1000
TO-92	17.5~19	5.0~7.0	2000

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